
Changes in Sexual Behavior by Young Urban Heterosexual Adults in Response to the AIDS Epidemic

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Synopsis

Young adults residing in four States were enrolled in the period 1985-88 in a multicenter study

of cardiovascular disease risk factors. In 1989, 2,729 members of the group were given a self-administered questionnaire that included questions on changes in sexual behavior that subjects had made in response to the epidemic of acquired immunodeficiency syndrome (AIDS). The final sample of 1,601 young, heterosexual, urban respondents included 412 white men, 568 white women, 224 black men, and 397 black women, all ages 21 to 40 years.

Overall, nearly 50 percent of the sample reported having made at least one change in their sexual behavior in response to the AIDS epidemic to decrease their risk of becoming infected by the human immunodeficiency virus. The mean number of changes was 0.8 for white men, 1.1 for white women, 1.6 for black men, and 1.5 for black women. Change was reported more frequently by black respondents than white, with no significant sex differences. The categories of respondents reporting behavior changes were more often young, with a history of recreational drug use, with more sex partners, or having had anal intercourse. The most commonly reported behavior changes were reducing the number of sex partners and being more careful in partner selection. Of the 54 percent of respondents who did not report any change in sexual behavior, about 70 percent reported unprotected sex with more than one partner in the previous year.

Significant sexual behavior change in response to the AIDS epidemic remains a goal for health education efforts.

PUBLIC HEALTH SEX EDUCATION EFFORTS aimed at reducing the risk of infection from the human immunodeficiency virus (HIV) have been underway in the United States for nearly a decade. A study of 397 men in San Francisco who practiced sex

with men showed a decline of 76 percent in the number reporting high-risk sexual behavior in the period 1984-88 (1).

Now there is concern about relapses from safer-sex behavior and the association between unsafe

sexual behavior and drug use (1, 2). The limited data available appear to show less behavior change among intravenous drug users from high-risk sex practices than from the practice of sharing injection equipment (3). Relatively little is known about changes in sexual behavior in the much larger low-risk population, although recent Swedish data indicate (4) indicate no significant overall changes in sexual behavior made to reduce the risk of HIV infection in the general population in the period 1986-89.

We report findings on changes in sexual behavior that were made in response to the acquired immunodeficiency syndrome (AIDS) epidemic, as reported by a self-selected group of young, heterosexual, urban, black and white adults living in four U.S. cities.

Methods

Participants in this study of sexual behavior change were recruited from young adults who enrolled in a multicenter study of risk factors for cardiovascular disease. The behavior survey was approved by the Institutional Review Board of each participating center. The recruitment and methods of followup for the cardiovascular study are described (5).

Briefly, 5,115 young adults (about 50 percent of those eligible for the study) residing in Birmingham, AL, Chicago, IL, Minneapolis, MN, and Oakland, CA, were examined for the cardiovascular study in 1985-86. A second cardiovascular examination conducted in 1987-88 included 4,624 respondents, with response rates of 94 percent for white men, 95 percent for white women, 85 percent for black men, and 88 percent for black women. Data were obtained from the second examination of the cardiovascular cohort on respondents' age, race, sex, level of education, city of residence, and reported lifetime frequency of use of cocaine, amphetamines, or opiates. Use of cocaine, amphetamines, or opiates was reported as numbers of times used: 0, 1-2, 3-10, 11-99, and 100 times or more.

In September 1989, all Minneapolis-resident participants and a 50 percent random sample of participants at three other sites were mailed self-administered questionnaires concerning sexual behaviors, attitudes, and beliefs related to the AIDS epidemic. The group of 2,729 persons was 677 white men, 777 white women, 541 black men, and 734 black women. The sampling fraction at the sites was determined by the availability of funds

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for the purpose and the need to assess the impact of the AIDS survey on the overall cardiovascular study.

Because the AIDS risk survey contained sensitive information, subjects were asked to respond anonymously and were assured that no individual responses would be sent to the clinical centers, where names would be known. Two additional mailings and a followup postcard were sent to improve response rates (6). The AIDS survey methodology is described (7).

Of the 2,729 persons mailed questionnaires, 1,971 questionnaires were returned (72 percent response rate). White women had the highest response rate (90 percent), black men had the lowest (48 percent), and rates for white men (79 percent) and black women (64 percent) were in the intermediate range (7). Response rates were 62 percent for high school graduates and those with less schooling and 75 percent for those with some college. No significant differences in response rates were observed among the four surveyed cities. Eight people were excluded from the analyses because of missing race and sex information, 5 because they reported never having been sexually active, and 251 because they reported a lifetime history of same-sex partners. Also excluded were those who did not answer any questions on sexual behavior changes (31 white men, 28 white women, 11 black men, and 41 black women). The final sample of 1,601 people consisted of 412 white men, 568 white women, 224 black men, and 397 black women.

The questionnaire assessed the respondents' past and present sexual behaviors, such as age at first vaginal or anal intercourse; the types of intercourse the subject had practiced (vaginal, anal, or oral); the number and sex of partners; duration of sexual relationships; use of condoms; and whether they had known someone with AIDS. Participants were asked if they had changed any of their sexual behaviors as a result of the AIDS epidemic. Among the five changes referred to were being more careful in the choice of a sex partner; having fewer sex partners; using condoms more often; becoming

Table 1. Reported changes in sexual behavior made in response to the AIDS epidemic by 1,601 young, heterosexual, urban adults, 1989

Type of change	Percent of white men (N = 412)	Percent of white women (N = 568)	Percent of black men (N = 224)	Percent of black women (N = 397)
Being more careful in choosing sex partner.....	26	31	54	44
Having fewer sex partners.....	23	31	50	44
Using condoms more often.....	20	23	40	31
Becoming celibate.....	3	8	8	10
Using spermicides ¹ more often.....	1	7	8	7
Made any change.....	31	37	60	53
Mean number of changes made ²	0.8 ± 0.1	1.1 ± 0.1	1.6 ± 0.1	1.5 ± 0.1

¹ Includes spermicidal jelly, cream, foam, and sponge.

² Mean plus or minus standard error of the mean.

NOTE: AIDS = acquired immunodeficiency syndrome.

celibate; and more frequent use of spermicidal preparations, such as jelly, cream, foam, or sponge.

Statistical analysis. A sexual behavior change variable, referred to as "any sexual behavior change," was calculated by summing the number of positive responses to queries about specific sexual behavior changes that might decrease the risk of HIV infection for each person. This derived variable was assessed in relation to the following subject characteristics: respondents' age at the time of the AIDS survey; race; sex; level of education; city of residence; hard drug use (amphetamines, cocaine, or opiates); age at first vaginal or anal intercourse; lifetime number of sex partners; length of sexual relationship; history of anal intercourse; and whether they had known someone with AIDS. Univariate associations were assessed using chi-square tests, two-tailed Fisher's exact tests, and Wilcoxon's rank-sum test (8). *P*-values of 0.01 or less were considered statistically significant in univariate analyses because of the number of comparisons made.

Unconditional multiple logistic regression was used to determine the odds that a person had made one or more sexual behavior changes, relative to the odds of not making any sexual behavior changes, adjusted for covariates. Interaction between covariates was tested with two-way, cross-product terms in the regression models. All logistic regression procedures were conducted using the computer program PROC LOGISTIC of the Statistical Analysis Systems (SAS) (9). The adjusted odds ratios were determined by exponentiating the regression coefficients from the multivariable logistic models; 95 percent confidence limits and two-tailed *P*-values were established from the regression coefficients and their standard errors.

Results

Overall, 43 percent of respondents included in the final sample reported having made at least one change in their sexual behavior in response to the AIDS epidemic (table 1). Those findings were based on responses from groups with widely varying response rates, which limited intragroup comparisons. The mean number of sexual behavior changes was 0.8 for white men, 1.1 for white women, 1.6 for black men, and 1.5 for black women. Behavior change was reported more frequently by black respondents than by white respondents.

Being more careful in the selection of sex partners and having fewer sex partners were the most commonly reported changes. Increased condom use was reported by about 20 to 40 percent of respondents. Among the 54 percent of respondents who reported that they had not changed any sexual behaviors in response to the AIDS epidemic, 69 percent of white men, 71 percent of black men, and 72 percent of women in both race groups reported that they had unprotected sex with more than one partner in the year preceding the survey (data not shown).

The proportion of participants who reported any sexual behavior changes made as a result of the AIDS epidemic is shown by race, sex, and other selected characteristics in table 2. Geographic differences in reported sexual behavior change were not significant. Among white men, behavior change was more frequent among younger respondents, and no significant differences were found across age groups in the other race-sex groups. There was a statistically significant trend only among white men for fewer behavioral changes associated with higher levels of education. Sexual behavior change increased significantly with increased frequency of

Table 2. Proportions of young, heterosexual, urban adults reporting having made at least one change in sexual behavior as a result of the AIDS epidemic, by selected characteristics

Characteristics	White men		White women		Black men		Black women	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Study site:								
Birmingham.....	70	31	82	30	54	56	79	41
Chicago.....	73	26	94	36	41	66	78	50
Minneapolis.....	195	31	272	38	72	63	114	63
Oakland.....	73	36	119	37	57	58	124	53
P value.....	10.66		10.65		10.73		10.02	
Age at AIDS risk survey (years):								
21-26.....	71	45	109	42	68	66	145	55
27-30.....	147	27	193	39	67	55	116	48
31-34.....	167	30	245	31	82	62	114	54
35-40.....	12	0	7	43	5	40	13	62
P value.....	20.01		20.04		20.47		20.97	
Education:								
Some high school or less.....	85	45	127	39	109	62	148	61
Some college.....	112	31	145	39	69	64	155	49
College graduate.....	199	24	281	33	43	51	78	46
P value.....	20.01		20.26		20.29		20.02	
Knowing someone with AIDS:								
Yes.....	99	34	204	40	50	64	100	59
No.....	203	30	255	34	123	63	231	52
P value.....	10.40		10.15		10.86		10.21	
Use of cocaine, amphetamines, or opiates:								
Never.....	165	18	248	22	129	60	265	48
1-2 times.....	36	42	66	41	23	61	41	71
3-10 times.....	78	31	112	45	26	65	44	61
11-100 times.....	88	42	94	51	31	48	21	62
More than 100 times.....	29	48	33	58	12	83	12	50
P value.....	20.01		20.01		20.83		20.08	
Age at first intercourse (years):								
12-15.....	72	46	81	49	83	67	104	68
16-17.....	93	34	155	41	53	53	135	53
18-19.....	103	31	160	37	37	54	97	47
20 or older.....	129	20	149	25	10	50	41	32
P value.....	20.01		20.01		20.09		20.01	
Number of sex partners in lifetime:								
1.....	60	5	77	0	7	29	32	9
2-4.....	68	9	112	16	30	40	100	34
5-8.....	91	29	132	43	37	43	109	59
9-15.....	91	44	125	45	59	58	92	71
16 or more.....	86	57	99	71	76	83	40	88
P value.....	20.01		20.01		20.01		20.01	
Length of current relationship:³								
Less than 3 months.....	16	38	32	63	21	52	27	59
3-11 months.....	28	57	38	76	17	76	44	77
1-3 years.....	92	33	120	52	43	77	91	51
4-6 years.....	79	16	113	19	49	49	50	52
7 years or more.....	99	6	172	7	53	45	98	30
P value.....	20.01		20.01		20.03		20.01	
History of anal sex:⁴								
Ever.....	50	34	61	43	28	82	41	63
Never.....	299	28	430	32	170	55	301	50
P value.....	10.37		10.01		10.01		10.10	
Number of partners in unprotected sex:⁵								
None.....	411	31	549	31	179	59	325	49
1.....	22	68	31	65	7	43	24	79
2 or more.....	42	79	41	83	26	81	32	72
P value.....	10.01		10.01		10.06		10.01	

¹ P values from chi-square test for homogeneity of proportions.

² P values from chi-square test for linear trend.

³ Length of current relationship with the steady sex partner, among those with a current steady partner.

⁴ Regular anal sex with the steady sexual partner, or any anal sex in the past

year with other partners.

⁵ Number of partners with unprotected sex in the past year.

NOTE: Numbers vary slightly in some analyses because of missing data. AIDS = acquired immunodeficiency syndrome.

Table 3. Characteristics associated with sexual behavior changes by young, heterosexual, urban adults reporting having made at least one change as a result of the AIDS epidemic

Characteristics	Men (N = 448)		Women (N = 742)	
	Adjusted odds ratio ¹	95 percent confidence interval	Adjusted odds ratio ¹	95 percent confidence intervals
Age ²	0.7	0.4, 1.1	0.9	0.6, 1.3
Race ³	2.8	1.8, 4.8	1.9	1.3, 2.8
Education ⁴	1.3	0.8, 2.2	1.3	0.9, 1.9
Knowing someone with AIDS ⁵	1.1	0.7, 1.8	1.3	0.9, 1.8
Used cocaine, amphetamines, or opiates ⁶	0.9	0.5, 1.5	1.2	0.7, 1.9
Age at first vaginal or anal intercourse ⁷	0.8	0.5, 1.4	0.5	0.3, 0.7
Lifetime number of sexual partners ⁷	5.0	3.0, 8.2	3.3	2.3, 4.8
Length of sexual relationship ⁸	5.0	3.0, 7.8	4.5	3.1, 6.5
Likelihood ratio test	143.24 (P = 0.0001)		144.27 (P = 0.0001)	

¹ Adjusted for the effects of all other variables in the model.

² Age at survey 30 years or older = 1, younger than 30 years = 0.

³ Black = 1, white = 0. This variable should be viewed as a marker for other, unidentified, risk factors.

⁴ High school or less = 1, more than high school = 0.

⁵ Yes = 1, no = 0.

⁶ Use more than 10 times in lifetime = 1, 10 times or less = 0.

⁷ Median or greater = 1, less than median = 0. Medians were sex-specific.

⁸ Duration of sexual relationship less than 1 year, or currently without a steady partner = 1, relationship 1 year or more = 0.

NOTE: AIDS = acquired immunodeficiency syndrome.

use of any type of hard drug among whites, but not among blacks.

Sexual behavior change was most commonly reported by respondents who began having vaginal or anal intercourse at young ages and was significant for all race-sex groups except black men. Those with the highest numbers of lifetime sex partners were most likely to report sexual behavior change, primarily that of reducing the number of partners. Tests for linear trend were significant for all four race-sex groups.

Among participants with a current steady sex partner, those who had been in a sexual relationship for 1 year or more were consistently less likely to report behavior changes than those who had been in a sexual relationship of less than 1 year duration, or who had no current steady partner; trends were significant across all race-sex groups except black men. Black men who reported anal intercourse as a usual pattern of intercourse with a steady partner, or any anal intercourse with a nonsteady partner, were significantly more likely than those who had not done so to report having made at least one sexual behavior change in response to the AIDS epidemic. Except among black men, those with the most sex partners in the previous year reported the highest frequency of behavior change. Having known someone with AIDS was not significantly associated with sexual behavior change among any of the race-sex groups.

Among heterosexuals who reported having made a behavior change, we considered whether respondents who claimed to engage in better partner selection also reported a higher frequency of con-

dom use and found that they did not. Among those claiming better partner selection, increased use of condoms was reported by 23 percent of white men, 25 percent of white women, 22 percent of black men, and 33 percent of black women (data not shown). Thus, unprotected intercourse was commonly reported among respondents who also reported some sexual behavior change.

Multiple logistic regression analysis of the association between any sexual behavior changes and respondents' characteristics is shown in table 3. Among men, independent predictors of sexual behavior changes included lifetime number of partners and either being in a sexual relationship less than 1 year or not having a current steady relationship. Predictors for women included age at first vaginal or anal intercourse, lifetime number of partners, and either being in a sexual relationship less than 1 year or not having a current steady relationship. Black race was a significant marker for sexual behavior change for both men and women respondents.

Discussion

The data suggest that perhaps fewer than half of a self-selected group of young, heterosexual, urban adults had made sexual behavior changes in response to the AIDS epidemic. As these young adults were concerned enough about their health to be participating in a longitudinal study of risk factors for cardiovascular disease, a condition likely not to affect them for decades, they might be expected to be more responsive to health education

messages than the general population of young, heterosexual, urban adults. Therefore, we believe that our estimates represent a "best case scenario" for risk reduction patterns among the surveyed populations.

More behavior changes were reported by respondents who were in higher risk groups: young age, drug use, many sex partners, without a long-term sex partner, and reporting anal intercourse. The specific behavior changes were usually with regard to more careful sex partner selection. The majority of respondents who reported any behavior change said that they were having fewer sex partners and were more careful in choosing a partner. In addition, 20 to 40 percent of those surveyed reported use of condoms more frequently than previously. However, of the 50 percent of respondents who did not report sexual behavior changes, about 70 percent reported having had unprotected sex with more than one partner during the previous year.

Multivariable analysis showed that blacks who responded were more likely to report sexual behavioral changes, even after adjustment for other high risk behaviors. The trend toward more behavior changes among blacks was present across study sites for the variables of female sex, age group, years in school, number of partners, and history of anal intercourse.

The location variable did not remain significant in multivariable analyses; therefore, it is unlikely that bias occurred as a result of the sampling scheme, whereby only blacks from potentially higher risk sites were included, because Minneapolis was oversampled and is predominantly white. Respondents who were in a high-risk group, based on high numbers of partners and lack of a long-term, steady sex partner, reported the greatest frequency of behavior change. Because the response rates, especially among black men, were low, our results may not be generalizable to other groups, and intragroup race-sex comparisons must be made with caution.

Interpretation of the data is limited also by the cross-sectional nature of the survey and its varied response rates. We have contrasted behavior change during the past year with lifetime partner information, rather than current partner information, in an effort to minimize artifacts resulting from recent behavior changes. However, it is possible that misclassification occurred, owing either to recall bias or selection bias.

It was not possible to assess the validity of responses. Although the original study from which the subjects were identified had a stratified sample

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of two populations, that study also had less than an optimal response rate (5). However, the refusal rates in the AIDS survey for the behavior change questions were low; only about 6 percent of the respondents retained in the analyses refused to answer at least one behavior change question. In other surveys, question-specific refusal rates on self-administered questionnaires among adults have ranged from 6 to 13 percent for sexual behavior items (10-12).

Item nonresponse was highest for black women (10 percent) and white men (6 percent), compared with white women or black men (both 4 percent). The reasons for the differential nonresponse are unclear, although it is possible that those not responding were less likely to have changed their behavior, either because they were at low risk initially, or because they perceived their risk to be less. An additional concern was ambiguity of response, in that it was difficult for participants to interpret the statements "reducing the number of partners," or "being more careful in partner selection." Thus, we were unable to quantify the magnitude of reported change.

Findings from other studies of sexual behavior change made in response to the AIDS epidemic are consistent with our findings. In 1988, interviews with 8,450 women ages 15 through 44 years, for the National Survey of Family Growth, showed that more than 25 percent of women interviewed reported that they had changed their behavior or that their partners were using condoms (13). As in the present survey, the women in the National Survey of Family Growth who perceived themselves to be at highest risk (as determined by self-report) reported the highest percent of behavior change (54 percent) and the highest proportion of partners using condoms (30 percent). A similar trend was noted for the number of lifetime partners: those with the highest number of lifetime partners reported the highest frequency of changes in behavior. In 1989, interviews with 209 heterosexual

HIV-negative men revealed a steady decline in numbers of sex partners since 1984 (14). As in the present survey, an increase in condom use was reported in the previous survey.

Optimism must be tempered by the finding that substantial numbers of those who are still at risk did not report any behavior changes. Thus, further efforts are warranted to reduce AIDS risk behaviors in the general and high-risk populations. Of concern is future recidivism among those reporting behavior changes. Recent data suggest that relapse behaviors are beginning to emerge among gay men in San Francisco, where profound risk reduction was documented previously (1).

The study data indicate that AIDS prevention efforts among young urban heterosexual adults need to be continued. Effective efforts would inform young persons, before they become sexually active, about the options of abstinence and monogamous relationships as well as high risk sexual behavior. Among the already sexually active, special outreach efforts could be directed toward those who have not yet changed their behaviors, despite a decade of AIDS education appeals. Those who have moderated their sexual behaviors need to be encouraged to continue to avoid risky behaviors. These approaches are essential to helping young, urban heterosexual adults in reducing their exposure to sexually transmitted diseases, including HIV.

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